



November 27, 2018

Ms. Marlene H. Dortch
Office of the Secretary
Federal Communications Commission
445 12th Street SW
Room TW-A325
Washington, DC 20554

Re: ET Docket No. 13-49, DA 18-1111

Dear Ms. Dortch:

APTIV COMMENTS

Aptiv has already deployed devices for the nation's US DOT's V2V safety and ITS V2I Smart City initiatives.

Dedicated Short Range Communications (DSRC) products are in production and continue to launch, indicating the start of the commercialization phase and rapid deployment to meet the 21st Century US Transportation initiatives. These initiatives provide the US significant new capabilities, ubiquitous secure interoperability, and high performance vehicle to everything (V2e) communications meeting crucial US transportation and mobility needs.

These initiatives build on many years of development including:

- DSRC spectrum coordination
- Connected vehicle test pilots
- Standards development
- Vehicle systems development
- Automotive safety field testing
- ITS infrastructure development alignment
- ITS services development
- Automated transport channelization
- Vulnerable road users integration
- Unique cyber secure privacy insured transportation security systems

Aptiv is in production with V2V DSRC devices starting with GM's 2017 Cadillac CTS.
Aptiv is also in production with Mcity's Ann Arbor Connected Vehicle Test Environment (AACVTE) Smart City Pillar 1.



Aptiv is pleased to submit the following comments in response to the Public notice ET Docket No. 13-49, DA 18-1111, in which the Commission seeks comments on the October 22, 2018 report for Phase I tests performed to evaluate potential sharing solutions between the proposed Unlicensed National Information Infrastructure (U-NII) devices and DSRC operations in the 5850-5925 MHz (U-NII-4) frequency band.

We note that this Test Report involves initial Unlicensed National Information Infrastructure (U-NII-4) devices and tests evaluating two 2016 spectrum sharing proposals in the 5.9GHz Band currently allocated to and in use by DSRC ITS Safety users.

Aptiv has reviewed the 5.9GHz Phase 1 Test Report and offers these comments.

The results presented in this report reveal that Aptiv DSRC 5.9GHz products already deployed and being prepared for 2019 deployments will experience harmful interference by both “detect and vacate” and “reallocate” U-NII-4 band sharing proposals.

Proposed “Reallocate” and “detect and vacate” operations will create interferences with Aptiv products operating on multiple DSRC 5.9GHz band channels.

The current Aptiv US 5.9GHz band V2x (DSRC) products include:

1. OEM V2v devices currently deployed in the GM Cadillac operate on the V2v channel 172 as coordinated by current FCC rules for the 5.9GHz ITS safety band.
2. Aftermarket VAD V2x devices currently deployed in the Mcity AACVTE operates on multiple channels including Ch 172 V2v, Ch 178 Control, and adjustable data channeling (PVD messages) as coordinated by FCC rules, within SAE band plan, and AACVTE deployments.
3. Our G2 (next gen) V2x devices currently operating in Ann Arbor along with other ITS locations are designed to operate across the channels in the full 75Mhz 5.9GHz band as currently allocated to DSRC use by FCC rules and regulations.

First Concern Area: Co-Channel Interactions - Degradation

Several of the Phase 1 Test Report’s U-NII-4 tests show degradation to messaging transmissions of a single DSRC device in the presence of U-NII-4 devices operating at 90% UNII4 channel occupancy in the DSRC safety band.

One example test reported:

6.2.4.3 DSRC 2 Transmitter Response to 20 MHz IEEE 802.11 Signal Transmission - Co-channel Interactions



“Degradation to DSRC 2 transmitter was observed when the simulated IEEE 802.11 signal channel occupancy reached approximately 90%.”

Aptiv is alarmed by this test result.

This points to significant issues with the U-NII-4 device disrupting more of the channel usage beyond, and much higher than, the U-NII-4 device’s intended 90% test occupancy.

This would be a similar scenario to recent unlicensed wifi operations disrupting an automated shuttle at one of our collaboration’s test site with a streaming video application transmitting on the 5.9Ghz ITS (DSRC) band.

Excessive harmful interference mechanism by the U-NII-4 device is suspected. The FCC should determine the appropriate degradation mechanism.

DSRC’s advanced WAVE technology is built with far superior performance to this test’s apparent 10% window of operation. DSRC is designed to operate at far more robust occupancy levels to accommodate many DSRC devices in range during normal operations and much higher numbers in common congestion conditions. Unlike Broadband type operations, advanced transportation DSRC networks are designed to be exchanging periodic uninterrupted (virtually real time) safety messages 10-50 times a second. Missed messages due to harmful interference by U-NII-4 devices that occupy the channel window simultaneously create risk to safety of life operations.

DSRC device degradation should occur at much higher U-NII-4 occupancy level (region of 99%) before impacting a set of single DSRC transmitting device with a single receiving DSRC device. Since DSRC is a very advanced “Ad Hoc” and “listen then talk” communication link, the DSRC OBU will fit it’s messaging into the 10% channel availability of these Phase 1 test windows as long as the test devices are operating to US Pilot deployment performance levels and cleared (non-operating) of devices producing harmful interference.

Similar tolerance window also applies to the Phase 1 tests with 55-85% occupancy rates. These tests seem to allow 15-45% non-occupancy windows for safe DSRC operations that 1 unit would be expected to easily “listen then talk”.

We are concerned about U-NII-4 devices coming into range with multiple DSRC devices operating above these channel occupancy windows. This 10% operating capacity test result is easily exceeded in DSRC normal deployment operations.

Second concern area: Channel Move Time

Aptiv assessment of Phase 1 Test Results through the Average Channel-move Time information indicates that these numbers are long, random, and DSRC devices would very likely experience harmful interference by U-NII-4 devices.



Test Reported: (following is quoted from the FCC Phase 1 Test Report)

7.2 Detect-and-Vacate Method

Once a DSRC transmission is detected, the time it takes a U-NII-4 AP (or STA) to move and retransmit at the new backup channel (i.e., channel-move time) appeared to be a random number that was a function of the DSRC signal power, added noise power, and the modulation and coding scheme of a IEEE 802.11ac signal.

The Average Channel-move time varied from 9.7 ms to 798.0 ms (Cisco Detector), and 0.3 ms to 385.16 ms (KEA Detector).

Aptiv assessment of this Test:

The average channel-move time – overlaps as many as 8 BSM windows (798ms)

These numbers are very concerning. They indicate extended embedded Channel Detect time and Channel vacate times. The detection time, housekeeping time to finish U-NII-4 current operation, vacate, and move the U-NII-4 to another channel are not evident to be close to 8usec.

Unlike Broadband type operations, advanced transportation networks are designed to exchange periodic safety messages 10-50 times a second, uninterrupted (virtually real time), and can't wait for next available window or slot if the U-NII-4 device is not vacated outside of these periods (20 – 100ms).

Third concern area: Key Missing Detect and Vacate tests.

Crucial tests are missing. The FCC Phase 1 Report states some tests are missing.

1. The Phase 1 Detect and Vacate test report does not state the U-NII-4 signals "Vacate" time.
 - a. The "vacate" time is the time required for the U-NII-4 device to no longer emit (transmit) on the DSRC band once U-NII-4 device is in range and has detected a functioning DSRC device.
2. The Phase 1 Detect and Vacate test also does not report the "detect" times.
 - a. The "detect" time is the time once U-NII-4 device is in range of functioning DSRC device that the U-NII-4 device detects the DSRC device.
3. The 2015 IEEE requirements test results are not provided in this report.
 - a. The IEEE 1609 "Tiger Team" March 2015 Report called for maximum detect time of 8us and immediate vacate time requirements. Aptiv is looking for the data results to insure no DSRC safety messages are harmfully interfered

with or delayed. This will cause critical message misses in DSRC's 10 to 50Hz applications. Inadequate channel availability also limits the number of vehicles during highly congested operations (200-1000 vehicles) covered within 300-1000m range safety transmissions.

4. FCC Phase 1 Report statements that vacate time test as not included.

1.1 Detect-and-Vacate Proposal (Page 15 of the Test Report states):

“It is noted that the cumulative move time will be a function of several factors such as signal detection and vacate time which are in turn dependent upon factors such as signal-to-noise ratio, and others. **The objective of this effort did not include investigating or analyzing the measured channel-move time, the relationship to channel vacate time, or the observed variances.**”

(Statements emphasized by Aptiv are shown in bold above)

5. FCC Phase 1 Report identifies regions of operation where U-NII-4 doesn't vacate immediately.

“1.5 Re-channelization Proposal Observations (Page 18) **There appears to be three distinct regions of performance when DSRC and U-NII-4 devices operate simultaneously in a co-channel configuration.”**

(Statements emphasized by Aptiv are shown in bold above)

Fourth concern area: Lack of Re-Allocation Tests to confirm new 30Mhz reduced DSRC Band plan non-harmful self-interferences.

The Re-Allocation Phase 1 testing does not include new DSRC safety messaging performance tests necessary to confirm DSRC capacity needs can meet the ITS Safety full deployment requirements and needs within the proposed new compressed 30Mhz safety band.

The ability of the DSRC V2v message channel 172 to move unharmed to Channel 180, which will operate now adjacent to the control channel 182 on one side, and also operate with the UNII channel 178 on the other side, is not tested.

The elimination of the 5Mhz protective guard band that is currently between DSRC V2v channel and the UNII band is not tested to confirm void of harmful interference.

The high power Public Safety Intersections channel 184 compatibilities with V2v channel 180 and Control channel with significant reduction in spectrum separation is not tested also.



DSRC OOB and IBE test data isn't available to assess DSRC's 30Mhz compressed band reallocation.

Observed impacts to DSRC Deployment from Broadband 5.9Ghz proponents:

ITS will require the entire 75Mhz band for deployment of the new Advanced 21st Century Transportation transformation initiatives for CV, CAV, and road to zero crashes. DSRC is designed to meet needs of over 300M Connected/Automated Vehicles, 300M Vulnerable Road Users, and 100M UAVs. Advanced Broadband capacity constraints and other limitations will not meet these requirements.

The spectrum uncertainty created by the long delay in the June 2016 Broadband sharing testing and reallocation testing continue to critically impact and damage the US Commercial Transportation Industry transformation rollout planned for 2020-2023CYs. Thus, this is impeding related US economic growth and related employment growth with ITS installations across the US ITS systems and over 300M US vehicles.

The impacts of the band uncertainty have been and will be observed in several areas:

- NHTSA's FMVSS #150 Federal register's planned V2V (NPRM) milestones has been placed "on-hold".
- Car Manufacturers' (OEM's) V2V deployments planned for 2019 will need to be altered
- US states and Cities beyond US DOT's Wave 1 Smart City Challenge and Fast Act (planned) initiatives will require technology modifications
- US entities such as State DOTs and Smart ITS locations that are proceeding with self-funded "Smart City" and ITS transportation plans will require additional funding to implement changes.

All of the above will utilize existing spectrum allocated for transportation with large transformational benefits to US citizen safety, transportation efficient modernization and US economics. FCC reallocation will cause new and additional delays. Continued delays or a repartitioning of the spectrum will significantly impact investments and open up the FCC to liability claims.

Aptiv recommendations:

Aptiv recommends the FCC close the 5.9Ghz spectrum repurpose investigations, enforce ITS Safety DSRC use primacy rights, and optimize license issuance process to help accelerate rapid ITS Safety and Connected Automated Vehicle deployments. Aptiv strongly recommends to clear and enforce the 5.9Ghz ITS spectrum regulations for the US ITS, CV, and CAV deployments underway.



We also request that the FCC eliminate the extended spectrum rights uncertainty for ITS Safety deployment and not allow further delays in deploying this critical technology.

Aptiv respectfully voices the need for the FCC and USDOT's Intelligent Transportation System band to remain intact for DSRC use only, and launched per current USDOT and US transportation industry full use initiatives to implement the critical US life/crash savings and modernization needs for which it is designed.

Aptiv recommends the FCC further evaluate the spectrum requirements of the new C-V2x technology based on full US deployment scenarios and expected vehicle life cycle.

In Summary:

- Entire US 5.9Ghz band must be reserved for ITS Safety. Deployment is ongoing and the full capacity is needed for US initiatives.
- The band must be maintained as “co-primary” reserved for the non-federal usage of ITS Safety only applications as currently coordinated and being deployed. New technology protocols need to be validated for scalability, interoperability, safety, quality and spectrum efficiency prior to new rule updates.
- FCC is requested to issue a statement preserving the allocation of the full 75Mhz spectrum with the 5.9Ghz ITS Safety band thereby allowing USDOT, NHTSA, FHWA, other federal agencies, and US transportation industry (including Aptiv) to proceed with the mass ITS Safety deployments.

Aptiv would be glad to meet with the FCC to discuss this information in detail. Please feel free to contact the following individuals for additional information.

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